it was agreed that the applied reference does not teach or suggest storing current waveforms for each of a plurality of test samples.

Claims 1-26 are all the claims presently pending in the application. Claims 1 and 14 have been amended to more clearly define the invention and claim 26 has been added. Claims 2-13 and 15-25 have been withdrawn from prosecution. Of the remaining claims, claims 1, 14 and 26 are independent.

Attached hereto is a marked-up version of the changes made to the claims by the current Amendment. The attached page is captioned "**Version with markings to show changes made.**" These amendments are made only to more particularly point out the invention for the Examiner and not for narrowing the scope of the claims or for any reason related to a statutory requirement for patentability.

Applicant also notes that, notwithstanding any claim amendments herein or later during prosecution, Applicant's intent is to encompass equivalents of all claim elements.

Claims 1 and 14 stand rejected under 35 U.S.C. § 112, first paragraph as indefinite. Claims 1 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawamoto, et al. (U.S. Patent No. 5,453,994).

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

The claimed invention is directed to a semiconductor device tester including an electron beam irradiator that irradiates a test sample with an electron beam, a current measurer that

measures current generated in a test sample by the electron beam, a memory that stores current waveforms for each of a plurality of test samples. The current waveforms include variations of the measured current for each of the plurality of test samples in correspondence with irradiation positions of the electron beam. The tester further includes a comparator that compares the current waveforms and, when a difference between the current waveforms exceeds a predetermined value, outputs an information related to the position on the test sample at which the difference exists.

Conventional semiconductor device testers which use electron beams compare the current waveforms against a desired current waveform which is based upon position data that was generated by using CAD (Computer Assisted Design) data. This position data must be prepared and stored in the device for each unique device design. This data can be quite large and time consuming to generate, to store and to transfer. Additionally, these conventional devices have also required replacement of this data if the design of the device being measured changes. Lastly, since these conventional devices rely upon the design data for determining defects, these systems are incapable of determining defects in randomly arranged devices for which design data may not be known.

By contrast, the present invention, provides a test device and method which provides results without relying upon CAD data. Rather, the present invention generates data from each of a plurality of test samples and compares that data to determine when one of those test samples is defective (see, for example, page 2 line 17 - page 3, line 3). In this manner, the present invention avoids any need to generate data based upon a design. Instead, the present invention is

capable of determining defects by comparing results between test samples to determine whether a defect exists (see, for example, page 3, lines 4-10).

The present invention is also capable of determining defects among randomly arranged devices without reference to CAD data. Additionally, the present invention obviates the need to transfer data between devices.

II. THE 35 U.S.C. § 112, SECOND PARAGRAPH REJECTION

The Examiner alleges that claim 1 is indefinite. While Applicant submits that such would be clear to one of ordinary skill in the art taking the present Application as a whole, to speed prosecution claim 1 has been amended.

Specifically, Applicant notes that claim 1 has been amended to remove any reference to "current value" and to clarify the meaning of the term "current waveform." In view of the foregoing, the Examiner is respectfully requested to withdraw this rejection.

III. THE 35 U.S.C. § 112, FIRST PARAGRAPH REJECTION

The Examiner alleges that claim 14 contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In particular, the Examiner alleges that the specification does not have support for the feature of "irradiating a second test sample having an identical circuit patten to a circuit pattern of the first test sample."

While Applicant respectfully submits that the specification does have support for this feature at, for example, page 15, line 18 - page 16, line 19 and Figs. 3 and 4, to speed prosecution claim 14 has been amended.

Specifically, claim 14 has been amended to remove the recitation of "irradiating a second test sample having an identical circuit patten to a circuit pattern of the first test sample." In view of the foregoing, the Examiner is respectfully requested to withdraw this rejection.

IV. THE PRIOR ART REJECTION

Regarding the rejection of claims 1 and 14, the Examiner alleges that the Kawamoto et al. reference teaches the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by this reference.

The Kawamoto et al. reference discloses a semiconductor test system which combines the features of a conventional tester 5, which analyzes a semiconductor device based upon signals received on output pads 2b in response to signals applied to input pads 2a, with a measuring device 8, which analyzes the device based upon signals generated in response to laser irradiation. However, as agreed during the March 10, 2003 personal interview, the Kawamoto et al. reference does not teach or suggest the features of independent claims 1 and 14 including: 1) a memory that stores current waveforms for each of a plurality of test samples; and 2) a comparator that compares those current waveforms. In other words, the present invention compares current waveforms of test samples.

To the contrary, the Kawamoto et al. reference is similar to the conventional measuring devices described in the present specification because the Kawamoto et al. reference also relies upon a comparison between data received by the test sample and data which was generated based upon CAD generated data.

Like the conventional art, the Kawamoto et al. reference compares data from the test sample with "expected value" data (see, for example, col. 2, lines 34-35; col. 4, lines 55-61; col. 5, lines 1-2). The Kawamoto et al. reference does not disclose the source of that "expected value" data. Indeed, the Kawamoto et al. reference only discloses that either an optical beam induced current (OBIC) is received or not. The Kawamoto et al. reference discloses using only a binary bit to determine whether an OBIC is either detected (1) or not detected (0) (col. 5, line 46 - col. 6, line 12; Table 1 and Fig. 2.). Binary data of "expected values" like that are easily obtained using CAD data and does not even require an approximation of a current waveform.

Indeed, the Examiner does not even attempt to point out where in the Kawamoto et al. reference a disclosure of a comparison between current waveforms of test samples. The Examiner cannot make this allegation because the Kawamoto et al. reference clearly does not teach or suggest this unique feature.

As explained above, the present invention, provides a test device and method which provides results without relying upon CAD data. Rather, the present invention generates data from each of a plurality of test samples and compares that data to determine when one of those test samples is defective (see, for example, page 2 line 17 - page 3, line 3). In this manner, the present invention avoids any need to generate data based upon a design. Instead, the present

invention is capable of determining defects by comparing results between test samples to determine whether a defect exists (see, for example, page 3, lines 4-10).

Clearly, the Kawamoto et al. reference does not disclose comparing data received from two test samples to determine whether one of those test samples is defective in accordance with the invention. As a result, the Kawamoto et al. reference is not capable of providing the advantages of the present invention discussed above.

Therefore, contrary to the allegations of the Examiner, the Kawamoto et al. reference does not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection of claims 1 and 14.

V. FORMAL MATTERS AND CONCLUSION

The Office Action objects to the Title. In particular, the Office Action alleges that a "new title is required that is clearly indicative of the invention to which the claims are directed." Applicant respectfully submits that a new Title is unnecessary. The Title recites a SEMICONDUCTOR DEVICE TEST METHOD in accordance with claim 14 and a SEMICONDUCTOR DEVICE TESTER in accordance with claim 1. Applicant respectfully submits that the Title is clearly indicative of the invention to which the claims are directed. Should the Examiner continue to assert otherwise, the Applicant respectfully requests that the Examiner state with particularity why the Title is not indicative of the invention.

In view of the foregoing amendments and remarks, and the agreement reached during the March 10, 2003 personal interview, Applicant respectfully submits that claims 1-26, all the

claims presently pending in the Application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the Application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 3/18/03

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Attachment:
Excess Claim Fee Payment Letter

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend claims 1 and 14 as follows:

1. (Amended) A semiconductor device tester [including electron beam irradiation means for irradiating a test sample to be tested with electron beam while scanning sad sample therewith and current measuring means for measuring current generated in said sample by the electron beam irradiation, said device tester] comprising:

electron beam irradiation means for irradiating a test sample with an electron beam;

current measuring means for measuring current generated in said test sample by said electron beam;

memory means for storing current waveforms for each of a plurality of test samples, wherein said current waveforms comprise variations of said measured current [values measured] for each of said [a] plurality of test samples [by said current measuring means while moving] in correspondence with [an] irradiation [position] positions of [by] said electron beam [irradiating means correspondingly to the irradiation positions as current waveforms]; and

comparator means for comparing the current waveforms [obtained for the plurality of test samples and stored in said memory means] and, when a difference between the current waveforms exceeds a predetermined value, for outputting an information related to the position on said test sample at which the difference exists.

14. (Amended) A semiconductor device test method [for determining the quality of a semiconductor device by using current generated in a test sample when irradiated with electron beam, said semiconductor device test method] comprising [the steps of]:

[irradiating] scanning a first test sample with an electron beam having a rectangular cross section, a longer side of which is substantially equal to a diameter of a contact hole [formed] in the first test sample, [while scanning the electron beam] in a scan direction perpendicular to [a direction of] the longer side, moving the scan position by a distance equal to the diameter of the contact hole in a direction perpendicular to the scan direction every time when the scan of one line is completed and storing values of current generated in the first test sample when irradiated with the electron beam in correspondence with [correspondingly to electron beam irradiating] positions of the electron beam as a first current waveform;

[irradiating] scanning a second test sample [having an identical circuit pattern to a circuit pattern of the first test sample] with an electron beam having a rectangular cross section, a longer side of which is substantially equal to a diameter of a contact hole [formed] in the first test sample, [while scanning the electron beam] in the scan direction, moving the scan position by a distance equal to the diameter of the contact hole in a direction perpendicular to the scan direction every time when the scan of one line is completed and storing values of current generated in the second test sample when irradiated with the electron beam in correspondence with [correspondingly to electron beam irradiating positions,] positions of the electron beam as a second current waveform; and

comparing the first current waveform with the second current waveform and, when there is a difference exceeding a predetermined value between the first and second current waveforms, extracting coordinates of a position corresponding to the difference.

Please add new claim 26 as follows:

- - 26. (Newly Added) A semiconductor device tester comprising:

an electron beam device that irradiates a test sample with an electron beam;

a current measurer that measures current generated in said test sample by said electron beam;

a memory that stores current waveforms for each of a plurality of test samples, wherein said current waveforms comprise variations of said measured current for each of said plurality of test samples in correspondence with irradiation positions of said electron beam; and

a comparator that compares the current waveforms and, when a difference between the current waveforms exceeds a predetermined value, outputs an information related to the position on said test sample at which the difference exists. - -